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LUNAR COMMUNICATIONS SERVICES – ON THE VERGE OF A COMMERCIAL REVOLUTION!

Abstract

The lunar economy is growing rapidly and several credible forecasts indicate a value of this market of over 100mdollars in the coming decade. Much of this activity is planned to be commercially driven, most notably through the char-

In addition to transport services, communications and navigation services will also largely be commercially provided. Initiatives are underway in the US, Europe and Japan to provide commercial communications and navigation services.

This paper focuses on the key European initiative, Moonlight. Moonlight is a programme of activities aimed at providing an enduring capability, initially of communications services to be later followed by navigation services.

The first node in the Moonlight constellation is the Lunar Pathfinder satellite, currently in development, and planned for a 2025 launch as part of the CLPS CS-3 mission. Lunar Pathfinder is a “public private partnership” between the European Space Agency (ESA) and Surrey Satellite Technology Ltd. NASA is also a key customer of Lunar Pathfinder through a barter agreement signed between ESA and NASA.

Following “hot on the heels” of Lunar Pathfinder, Moonlight’s Lunar Communications and Navigation System (LCNS) will be deployed later in the decade in two stages – an initial operational capability targeting a 2027 launch followed by a full operational capability, adding further services, towards the end of the decade. The industrial team developing LCNS commenced the implementation phase (B2/C/D/E) in the first quarter of 2024. Lunar Pathfinder will offer data relay communication services for 8+ years to other lunar missions – orbiters, landers and rovers. Lunar Pathfinder’s services will allow other lunar assets to avoid their own “Direct to Earth” (DTE) capability with three key benefits for those assets – (1) lower cost of data communications, (2) the ability to communicate when DTE is impossible e.g. when shadowed by craters or when operating on the far-side and (3) lower volume, mass and power requirements for the communications equipment compared to DTE for a given data rate.

The paper will present a detailed overview of the communications services that Lunar Pathfinder and LCNS are offering in support of lunar missions. The paper will address interoperability issues – through the LunaNet initiative – and will provide an overview of the communications system architecture and the satellite design.